

## SECTION IV. THEORY OF OPERATION

### 10.4.1 INTRODUCTION

The rain gauge for the ASOS operates in the same manner as all tipping bucket rain gauges, but has been modified to transmit light pulses for each tip of the bucket back to the ASOS data processing system. With the rain gauge part of a computer-based system, compensation can be made for rain-rate dependent errors, which results in increased rain gauge accuracy and dependability. This section describes the tipping bucket sensor and the error correction. A wiring diagram of the sensor is provided as figure 10.4.1 to depict the sensor's operation.

### 10.4.2 DESCRIPTION OF OPERATION

The tipping bucket is located under a funnel in the collector housing. The bucket is a two-chamber container that pivots. Precipitation flows through the funnel into one compartment until 0.01 inch of rain (18.5 grams) is accumulated. That amount of weight causes the bucket to tip on its pivots, dumping the collected water and moving the other chamber under the funnel. The tipping motion activates a switch, thereby establishing a momentary closure for each 0.01 inch of rain. Rain gauge output is one electrical pulse for each 0.01 inch of precipitation collected. Fiberoptic Transmitter A2A2A1 converts the electrical pulse to a light pulse suitable for fiberoptic transmission to the data collection package (DCP). Power to produce the light pulses is supplied by a 3.6-volt lithium battery, which is part of Fiberoptic Transmitter A2A2A1. A pulse is transmitted each time the tipping bucket fills. The sensor is heated by two electrical heaters: a 150-watt, 110-volt flexible heating element is cemented to the back of the collector funnel, and a 175-watt, 110-volt band heater is mounted on the drain tube. Each heater is controlled by its own thermostat, which is set to close (turn the heater on) at temperatures below 40°F. A third thermostat (located on the sensor bottom plate) is normally closed and opens at temperatures below -20°F. This thermostat removes power from the heaters to conserve energy under conditions when precipitation would not normally occur. The thermostat closes again as the temperature rises above -12°F to return power to the heaters. The DCP provides all of the required heater ac power. A safety switch is mounted on the rim of the lower case. This switch removes power from the collector heater female plug when the collector is removed, thus removing a potential electrical hazard. The safety switch does not remove power from the drain tube heater. As such, the technician must ensure that rain gauge power is removed at the DCP circuit breaker module before servicing the rain gauge. Also, the technician must use caution to avoid thermal burns when working near the heaters.

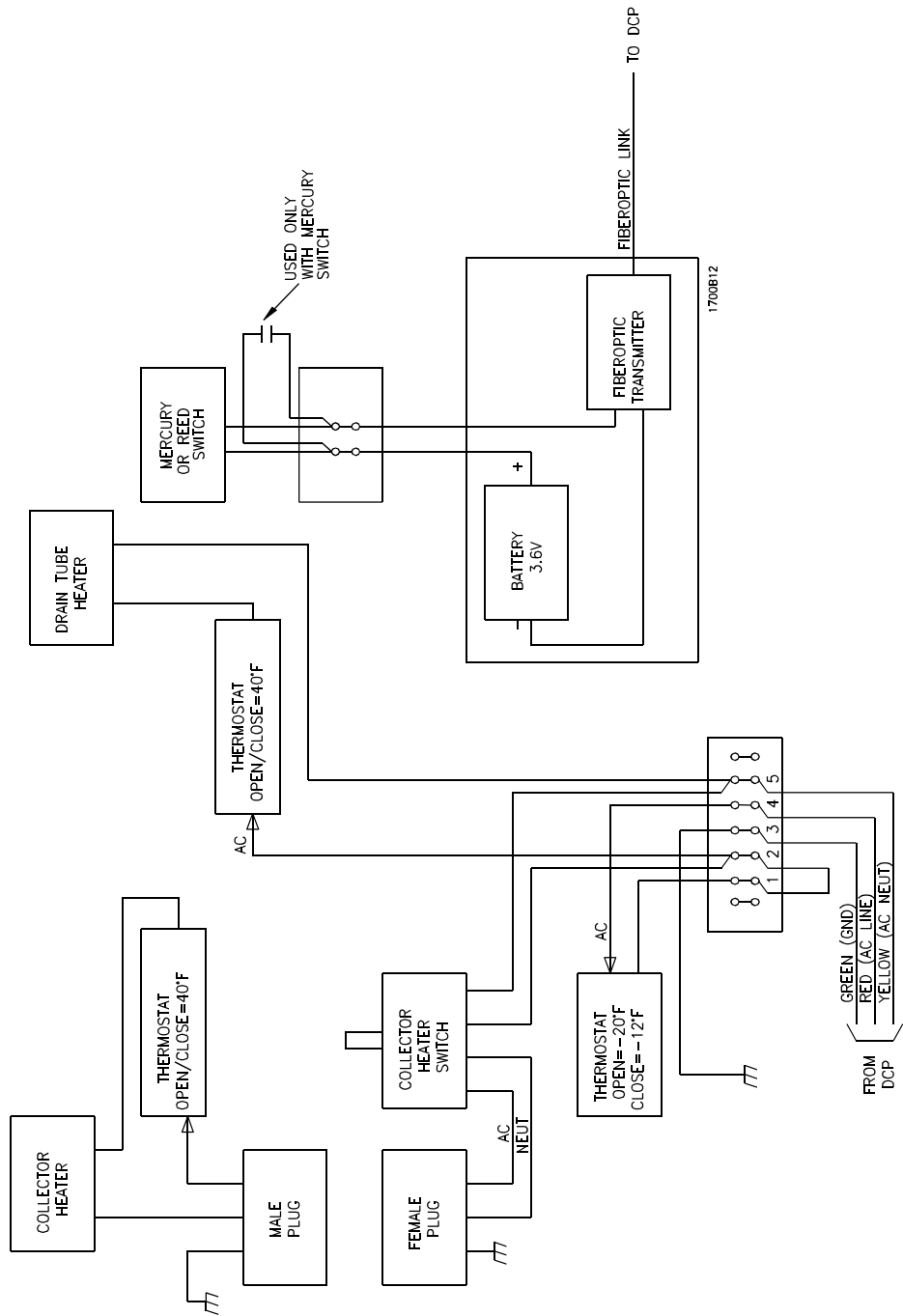


Figure 10.4.1. Liquid Precipitation Accumulation Sensor Wiring Diagram